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side. It is making a continuous endeavor to reduce all facts to a single least common denominator through which alone a universal comparison of facts is possible. Its first step in this endeavor is to sift out of the facts all except visual data. Auditory, olfactory, tactual—all kinds of data other than visual data are retained only in the complete absence of pertinent visual data.

The second step is to mold these visual data into a system of units—centimeters, cells, atoms, *etc.*—by means of which bodies of knowledge are separated. Within these bodies of knowledge all facts are comparable, and each body is known as a science. These bodies of knowledge are scattered, more or less isolated, standing to each other very much as one nation stands to another in a nationalistic state of society. There is complete comparability of facts within a body of knowledge defined by scientific units, but there is virtually no comparability of facts between the different bodies of knowledge.

Then the third step is the organization of the units themselves into a system where each unit is comparable with each other unit, and where consequently any fact of any body of knowledge is comparable with any fact of any other body of knowledge. This step is accomplished by subordinating units to one another, and calling the fundamental units elementary and the subordinate ones derived. The final result of this third step will be the subordination of all units to a few fundamental ones. We are even able to foretell what these fundamental units will be. They will be the centimeter, the gram, the second, and the radian. When all science is interpretable in terms of these units, it will have reached its goal on its material side.

From the crude fact to the visual datum, from the visual datum to the scientific unit, from the scientific unit to the organization of units, and the ultimate interpretation of the fact in terms of centimeters, grams, seconds, and radians—we see the transformation of sensation into scientific knowledge.

STEPHEN C. PEPPER.

CONCORD, MASS.

DUALITY AND DUALISM

IN what follows I am not to be understood as arguing in behalf of epistemological monism. So far as I know I have not a chemical trace of interest in it. And if my argument does not on that account run in behalf of epistemological dualism, it is because dualism appears to me only two monisms stuck loosely together, so that all the difficulties in monism are in it multiplied by two. If my position must be labeled, I should prefer to call it empirical pluralism, for it is actuated by respect for the plurality of observable facts.

To my mind the logic of Dr. Drake¹ is unduly simplified. It amounts to assuming that wherever you have numerical duality in perceiving there you have epistemological dualism. Now there is numerical duality in perception, namely, the difference in time and place, *etc.*, of the organic event of sensing, imagining, *etc.*, from that of its extra-organic cause. Consequently there is epistemological dualism. Q.E.D. Whether this argument affects the monistic realists or not is for them to determine. But an empirical pluralist is certainly untouched by it. To him the duality is also a triplicity, a fourness, a fiveness, . . . ; and in addition the numerical diversity, however great or small, has nothing to do with knowledge. It is of precisely the same nature as the numerical diversity in any train of events which is construed as causes-effects—or antecedents-consequents. The affair of knowledge enters in only when one of the series is *used* as evidence for inferring some other one in the series, whether antecedent to it or consequent upon it. Only when the numerical diversity of evidence and what is inferred from it becomes an adequate ground for epistemological dualism, will the numerical duality of extra-organic cause and intra-organic event, which is found in all perceptions, even set a problem for an empirical pluralist.

I might well leave the matter here. But it happens that Dr. Drake uses terms which show what the cause of his difficulty is. He says: "The question is: Do the images exist in the object, are they numerically identical with some parts of it, or, are they numerically different, existing at other points in space, and only similar to it and representative of it"? Now so far as his reference to me is concerned (and the same holds as to his earlier article),² the last clause, "similar to it and representative of it," shows that he has missed the point of my analysis of perception and of knowledge by means of perception. For Dr. Drake assumes that I must hold what he holds; namely, that the organic sensory-cerebral event (sensation-image in the usual phraseology) is intrinsically *representative* of its extra-organic cause; in short, is in its very occurrence a fact of the knowledge order or genus. Now this is just what I deny, holding that the event *becomes* cognitive only when *used* as representative, that is to say, as evidence for inferring some other event. Smoke is numerically different from fire, has (or may have) a different locus in space, exists at a different time, *etc.* But it is not inherently representative of fire, although we learn to use it as sign or evidence or representation of fire. This sort of physical numerical duality is literally that which I find figuring in all knowledge. And as I have already said, there is always *more* than duality. The smoke affects my nostrils—there is a smell; my eyes—there is a sight. The smell, the

¹ This JOURNAL, Vol. XIV., especially pp. 368–69.

² This JOURNAL, Vol. IX., p. 152.

sight affect my brain, my muscles. A whole series of physical effects is found in every case of the happening of sensory responses. A popular account would be content to say that we go direct from smoke to inferring fire. A more careful one will say that we go from an intra-organic event to smoke and from that to fire. But this is the difference between a more careful and extensive account and a rougher, more summary account. It is a difference in the detail of a series continuously physical in all its constituents. At no point is there a switch from one order or genus of Being to another. And without such a switch there is neither epistemological dualism nor does the demand for an epistemological monism arise. The key to the notion that there is such a switch (to be formulated in a dualism or explained away in a monism) arises from failing to note that representation is an *evidential function* which supervenes upon an occurrence, and from treating it as an inherent part of the structure of the organic events found in sensings. There are no physical events which contain representation of other events as part of their structure. Hence a separate world called psychical is provided for these hasty products of elision and telescoping.

To avoid misunderstanding let me say that the retort that the smoke is not a "conscious datum" while sensations and cerebral events are conscious data is not a reply, but a repetition of the same ignoring of the position. For the position herein recapitulated holds that to call anything "conscious" (so far as the requirements of this argument concern the word) is simply to say that it figures within the inferential or evidential function.

JOHN DEWEY.

COLUMBIA UNIVERSITY.

REVIEWS AND ABSTRACTS OF LITERATURE

Wissenschaftslehre. B. BOLZANO. *Hauptwerke der Philosophie in original getreuen Neudrucken.* Band VII. Neu herausgegeben von Alois Häfler. Leipzig: Verlag von Felix Meiner, 1914. Zweiter Band. Pp. viii + 568.

In Volume II. of the *Wissenschaftslehre*, Bolzano continues¹ his exposition of the "elementary theory" of which the first part was considered in Volume I. The second part Bolzano devotes to general qualities of propositions and classification of propositions. This classification is made first, with reference to properties (Vol. I., § 80) and second, with reference to relations. A final chapter of the second part contains an exposition of propositions containing terms having

¹ The first volume of the *Wissenschaftslehre* was reviewed in this JOURNAL, Vol. XIII., p. 328.